

3.—*On a Nearly Perfect Skull of a New Species of the Gorgonopsia.*

—By R. BROOM, M.D., D.Sc.

THE skull here described was found by Mr. S. H. Haughton on the farm Dunedin, Beaufort West, about 3 miles WSW. of the homestead. The exact horizon of the beds is still uncertain, but they must be at least 2,000 feet above the horizon of Beaufort West. Whether they correspond to the *Cistecephalus* beds or may be as high as the *Lystrosaurus* zone is at present in doubt. We know that *Cistecephalus* occurs at Kuilspoort probably 1,500 feet above the horizon of Beaufort West, and about 500 feet higher up there are obscure indications which incline me to believe we are into the *Lystrosaurus* zone, but as Dr. Rogers, who has gone over the ground, is rather opposed to this idea, we must at present leave the matter in doubt. In any case it is quite certain that the specimen comes from a very much higher zone than does *Gorgonops torvus*, Owen. Owen's type comes from Fort Beaufort, and it has also been obtained at Beaufort West, so that there is no doubt it belongs to the lower part of the *Endothiodon* zone, not more than a few hundred feet above the *Parciasaurus* zone. Another Gorgonopsid occurs in the same zone, viz. *Scymnognathus whaitsi* recently described by me. The occurrence of a new Gorgonopsid at a very much higher horizon is thus particularly interesting, and the fact that the skull is the most perfect known and reveals most of the details of the structure makes the find a most important one.

The skull measures 190 mm. in length, and the greatest width across the temporal region is about 128 mm. The snout is rounded and broader than deep. The nostrils are directed forwards and are much flattened as in *Gorgonops torvus*. The frontal region is broad and the orbits look more outwards than upwards. The parietal region is as broad as the frontal and the temporal fossae of fair size. The occiput is nearly vertical, sloping only very slightly backwards from the parietal.

The premaxillary is similar to the Therocephalian type. It bears 5 rounded and pointed incisors. I do not find any evidence of

serration, though the evidence is not quite conclusive. The 5 incisors measure 23 mm.

The septomaxilla is also as in Therocephalians. The posterior process is long and separates the anterior part of the nasal from the maxilla.

The maxilla is large and deep. In front it overlaps the premaxilla. There is a single fair-sized canine situated 8 mm. behind the last incisor, and measuring in section 8.5 mm. by 6 mm. There are a few small rounded molars, but the exact number cannot be made out with certainty. Three are preserved. Possibly the original number was 5. These molars are only about  $\frac{1}{3}$  of the size of the incisors.

The nasal is large and fairly wide. It is only slightly wider at the front and behind than it is in the middle. The internasal process is evidently feeble.

The prefrontal is large and forms the upper and anterior quarter of the orbital margin. It unites behind with the postfrontal, shutting out the frontal from the orbit. In this it agrees with the conditions in the higher Cynodonts and differs from all known Therocephalians, and also from the lower Cynodonts and from the Anomodonts.

The lachrymal is of moderate size, and the canal seems to be inside the orbit.

The jugal is fairly large but much hidden by the overlapping squamosal and postorbital.

The frontal is large, the two forming most of the interorbital region. On its outer side it articulates with the prefrontal and postfrontal. Behind it meets the parietal and preparietal.

In the middle line between the two frontals and the two parietals is a small median bone, manifestly the bone which in the Anomodonts has been called the preparietal. This character is perhaps the most interesting in the skull. For long the little median bone which lies mainly in front of the parietal foramen has been known in the Anomodonts. It has been variously named parietal, interparietal and preparietal. Quite certainly it is neither the parietal nor the interparietal, and the name preparietal proposed by Seeley and adopted by myself and others seems the best name for it. It is known in all Anomodonts except *Cistecephalus*, but hitherto it has not been recognised in any other group. The discovery of a preparietal in another group is thus of great interest. It pretty certainly does not occur in most Therocephalians. That it should occur in the Gorgonopsidae, the group which in some other respects most approaches the Anomodonts adds further confirmation to the view I expressed many years ago that the Anomodonts are descended

from a Therocephalian ancestor. In some Anomodonts the foramen is in the middle of the bone; in others the bone lies in front of the foramen though forming its anterior wall. In no known Anomodont is the foramen as here between the parietals and the preparietal away from the foramen.

The postfrontal is unusually large. In Anomodonts it is always small, and in Therocephalians it was also small where it could be made out distinctly. Here it forms much of the orbital margin and quite a large part of the upper cranial wall. For the most part it lies between the frontal and the postorbital. Posteriorly it meets the parietal.

The parietal is about as large as the frontal. In front it meets the preparietal, the frontal, the postfrontal; while laterally it is supported by the postorbital, which completely shuts it out from the temporal fossa. Posteriorly it meets the large median interparietal, and posterior-laterally the squamosal.

The postorbital is large. It forms most of the postorbital arch, and its posterior extension forms the whole of the upper margin of the temporal fossa.

The squamosal is very large and forms practically the whole of the back of the temporal fossa. Its inner side articulates with the interparietal and the exoccipital, and forms about  $\frac{1}{3}$  of the occiput. The ends of the parietal and the postorbital are clasped by the upper and inner part of the bone. Immediately outside the lateral occipital foramen the squamosal has a vertical posterior ridge which apparently delimits the occiput proper from the groove which is probably the auditory groove. The lower and outer part of the squamosal passes down and almost entirely conceals the quadrate. The outer part of the bone curves outwards and then forwards, forming most of the zygomatic arch. Much of the inner side of the arch is, however, formed by the jugal.

The interparietal is a large median bone a little broader than deep. It is bounded above by the parietals, laterally by the squamosals and inferiorly by the exoccipitals.

The exoccipitals appear to form the whole of the occipital region above and to the sides of the foramen magnum. There is a well-developed lateral process which apparently meets the quadrate.

The quadrate lies almost entirely in front of the descending part of the squamosal, and is thus scarcely seen when viewed from behind. Towards the quadrate there runs out a long process of the pterygoid, but whether it reaches the quadrate is not quite clear. The quadrate certainly has a short process which runs forward and

inwards towards the pterygoid, but between the two there seems to be another element. If this is so it will probably prove to be the alisphenoid. As the specimen is slightly crushed one cannot be quite positive on this point.

There is an elongated stapes not unlike that of *Cynognathus*, which stretches from the quadrate to the foramen ovale, which lies as in the Anomodonts in the process formed by the basioccipital, basisphenoid, and doubtless the pro-otic and opisthotic.

The basioccipital is a small bone which appears to form most of the single occipital condyle. The foramen for the IXth, Xth, XIth, and XIIth nerves is as in the Anomodonts far back by the side of the condyle.

The basisphenoid meets the basioccipital very much as in the Anomodonts, but in front the bone differs in having a strong deep median keel as in *Bauria*.

The pterygoid is rather peculiar. It has a large posterior process towards the quadrate and also a broad support along the basisphenoid. It has, as in most Therapsida, a powerful lateral process by the side of the mandible, but the anterior development is smaller than in any other of the Therapsida except the Anomodonts. I fail to find any teeth on the pterygoid.

The transpalatine is well developed but also of an unusual character and quite unlike that of the Therocephalia. It forms quite a large part of the bony palate and the anterior part of the lateral descending process.

The palatine is a large bone which takes the place usually occupied by the anterior part of the pterygoid. It also forms most of the bony palate. On the inner part are a few fairly large teeth.

The vomer is not displayed, but probably is as in *Gorgonops* and *Scymnognathus* a true median vomer.

The greater part of each mandible is preserved. The dentary is powerful but the coronoid process probably short. The splenial is also well developed but does not extend far back. The angular is apparently pretty similar to that of *Scymnognathus*. It passes well forwards between the dentary and splenial. The exact nature of the articular region cannot be made out with certainty. Besides an articular it seems there may be a prearticular.

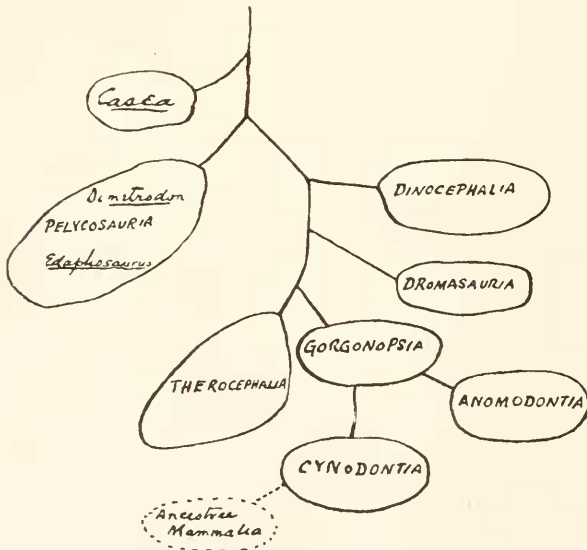
The skull is particularly interesting as showing that the Gorgonopsidae differ in many important characters from the Therocephalian type seen in *Scylacosaurus*, and also by showing some striking resemblances to the skulls of Anomodonts and Cynodonts. In the structure of both the upper cranial region and the palate there is a fore-

shadowing of the peculiar Anomodont type. In the arrangement of the frontals, postfrontals, postorbitals, preparietal, and parietals we have almost the Anomodont condition. The palate of course differs markedly. Still the pterygoid with its very short anterior part meeting the palatine instead of the prevomer and the peculiar condition of the transpalatine are just what we should expect in the Anomodont ancestor. The relations of the stapes, basioccipital, and basisphenoid are almost exactly as in the Anomodonts.

Though the relationships to the Cynodonts are not quite so evident, still this type comes nearer to the Cynodont than does *Scylacosaurus*. If the palatine bones curved over and made a secondary palate and the maxillae also joined over, the whole palate would be not unlike that of the Cynodont. The occiput would resemble that of the Cynodont if the opisthotic were shown on the posterior surface, but this is not a very important character when we consider how variable it is in mammals.

It seems necessary to revive Seeley's Gorgonopsia as a distinct sub-order of the Therapsida for reptiles of the *Gorgonops* type.

The relationships of the various sub-orders of the Therapsida may be expressed as follows:—



For the new skull I suggest the name *Scylacos capensis*, g. et sp. nov.